

AMENDMENTS TO THE DRAWINGS

In response to the drawing objection, a replacement sheet is submitted herewith so as to label Figure 1 as --Prior Art--, and to change the drawing sheet pagination from "1/1" to "1/2". In addition, a new drawing sheet (Figure 3) is submitted herewith to show the feature of "a light-emitting diode comprising a flip-chip-type gallium nitride compound semiconductor light-emitting device".

Attachments: One (1) Annotated Sheet (Figs. 1 and 2)
One (1) Replacement Sheet (Figs. 1 and 2)
One (1) New Drawing Sheet (Fig. 3)

REMARKS

Upon entry of the present Amendment, Claims 1, 4-9 and 12 will be all the claims pending in the application. Claims 1 and 9 have been amended. Claims 2-3, 10-11 and 13 have been canceled without prejudice.

Claim 1 has been amended to more clearly point out the claimed subject matter. Claim 1 has been amended to recite an adhesion layer composed of titanium which is provided on said ohmic electrode layer and has a thickness of 1000 Å to 3000 Å. Support for the amendment to Claim 1 can be found in the specification, for example, at page 9, second paragraph.

Claim 9 has been amended to more clearly point out the claimed subject matter. Claim 9 has been amended to recite an adhesion layer composed of titanium which is provided on said ohmic electrode layer and has a thickness of 1000 Å to 3000 Å. Support for the amendment to Claim 1 can be found in the specification, for example, at page 9, second paragraph.

No new matter has been added. Entry of the Amendment is respectfully requested.

I. Drawings Objections

In response to the drawing objection, a replacement sheet is submitted herewith so as to label Figure 1 as --Prior Art--.

In addition, a new drawing sheet (Figure 3) is submitted herewith to show the feature of "a light-emitting diode comprising a flip-chip-type gallium nitride compound semiconductor light-emitting device". No new matter has been added.

Claim 13 has been canceled.

Withdrawal of the objection and acceptance of the replacement sheet and the new drawing sheet are respectfully requested.

II. Claim Objection

Claim 3 was objected to under 37 C.F.R. § 1.75(c), as being of improper dependent form for failing to further limit the subject matter of a previous claim. The Examiner asserts that Claim 3 recites a range of thickness wider than that of Claim 2.

Claim 3 has been canceled. Withdrawal is respectfully requested.

III. Claim Rejections under 35 U.S.C. § 112

Claims 1-13 were rejected under 35 U.S.C. § 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which Applicants regard as the invention. Claims 1 and 9 were rejected as being lack of sufficient antecedent basis for various recitations. Claims 2-8 and 10-13 were rejected because they depend on the rejected Claims 1 and 9.

In the accompanying amendments, Claims 1 and 9 have been amended to introduce proper antecedent basis for each recitation recited therein. Applicant respectfully submit that the amendments to those claims render the rejection under 35 U.S.C. § 112, second paragraph moot and request the rejection be withdrawn.

IV. Claim Rejections under 35 U.S.C. § 102/§103 Over Kamimura

Claims 1, 6, 8-9 and 12-13 were rejected under 35 U.S.C. § 102(a) as allegedly being anticipated by Kamimura et al. (JP 2002368271 A; “Kamimura”).

Claims 2-5, 7 and 10-11 were rejected under 35 U.S.C. § 103(a) as allegedly being unpatentable over Kamimura.

Applicants respectfully traverse the above rejections.

Independent Claims 1 and 9 presently recite an adhesion layer composed of titanium which is provided on said ohmic electrode layer and has a thickness of 1000 Å to 3,000 Å.

Applicants respectfully submit that Kamimura does not anticipate the present claims because Kamimura fails to describe the claimed thickness of the adhesion layer. In addition, Applicants respectfully submit that Kamimura does not render the presently claimed invention obvious, as discussed below.

Further, Applicants submit herewith a partial translation of the relevant sections of Kamimura.

Kamimura discloses a flip-chip-type gallium nitride compound semiconductor light-emitting device including positive electrode (20) having a three-layer structure (18p, 20a, and 20b) comprising an ohmic electrode layer composed of rhodium (p electrode 18 which consists of Rh) contact with p-type semiconductor layer (15), an adhesion layer composed of titanium (a substrate layer 20a which consist of Ti) provided on the ohmic electrode layer (18p) and having a thickness of 10 Å or more (10 nm, i.e. 100 Å), and a bonding pad layer (the upper layer 20b) provided on the adhesion layer (20a) and composed of a metal selected from the group consisting of gold, aluminum, nickel, and copper, or composed of an alloy containing at least one of these metals (Au, i.e. gold).

However, Kamimura fails to disclose an adhesion layer composed of titanium which is provided on said ohmic electrode layer and has a thickness of 1000 Å to 3,000 Å.

Instead, Kamimura discloses a substrate layer having a thickness in a range of 1 nm to 100 nm (10 Å to 1000 Å) and preferably in a range of 5 nm to 50 nm (50 Å to 500 Å). Paragraph [0010].

Pursuant to MPEP § 2131.03, Kamimura fails to disclose the claimed thickness range of amended Claims 1 and 9 with sufficient specificity to constitute an anticipation. In particular, Kamimura's entire preferred range (50 Å to 500 Å) is far outside of the claimed thickness range (1000 Å to 3000 Å), and there is nothing in Kamimura which would lead one skilled in the art to select an adhesion layer having a thickness of 1000 Å to 3000 Å as claimed. Notably, as discussed in further detail below, the thickness of the substrate layer (adhesion layer) disclosed in the working Example of Kamimura is 10 nm (100 Å).

Kamimura also does not render obvious the presently claimed invention for the following reasons.

Kamimura teaches away from the claimed adhesion layer having a thickness of 1000 Å to 3,000 Å. In particular, Kamimura teaches forming a substrate layer (adhesion layer) to be as thin as possible in order to restrain an electrical resistance. Paragraph [0010]. Kamimura describes that the thickness of the substrate layer is preferably in a range of 5 nm to 50 nm (50 Å to 500 Å). The thickness of the substrate layer disclosed in the working Example of Kamimura is 10 nm (100 Å). Paragraph [0023]. Thus, there is no apparent reason which would lead one of ordinary skill in the art to modify Kamimura to increase the thickness of the substrate layer to arrive the claimed invention.

In addition, the claimed flip-chip-type gallium nitride compound semiconductor light-emitting device provides excellent lift-off performance in the electrode formation process using an adhesion layer having a thickness of 1,000 or more as described at page 9, lines 2-19 of the specification. This characteristic feature in the invention is not disclosed by Kamimura.

Accordingly, Applicants respectfully submit that Kamimura neither anticipates nor renders obvious the presently claimed invention.

V. Conclusion

For at least the foregoing reasons, all the pending claims are believed to be allowable. Applicants respectfully request reconsideration of the application and the timely allowance of the pending claims.

In view of the above, reconsideration and allowance of this application are now believed to be in order, and such actions are hereby solicited. If any points remain in issue which the Examiner feels may be best resolved through a personal or telephone interview, the Examiner is kindly requested to contact the undersigned at the telephone number listed below.

The USPTO is directed and authorized to charge all required fees, except for the Issue Fee and the Publication Fee, to Deposit Account No. 19-4880. Please also credit any overpayments to said Deposit Account.

Respectfully submitted,



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Partial Translation of Kamimura (Japanese Unexamined Patent Publication No. 2002-368271)

[0010] It is preferable that a thickness of a substrate layer is smaller than that of an upper layer. Namely, it is preferable that a thin substrate layer is formed on a surface of a p-side electrode and a thick upper layer is formed on the thin substrate layer. A rise in electrical resistance due to the substrate layer is restrained by forming a thin substrate layer. Further, an adhesive property between a p-side electrode film and an Au bump is improved by forming a thick upper layer. A thickness of a substrate layer is, for example, in a range of 1 nm to 100 nm and preferably a range of 5 nm to 50 nm. A thickness of an upper layer is, for example, in a range of 0.1 μm to 50 μm and preferably a range of 0.3 μm to 3 μm .

[0023] A p-side electrode film 20 and an n-side electrode film 21 consist of a substrate layer 20a and 21a, which are formed out of Ti, and a upper layer 20b and 21b stacked thereon, which are formed out of Au, respectively, and are formed by a lift-off method. In this example, the thickness of each of the substrate layers 20a and 21a was 10 nm, and the thickness of each of the upper layers 20b and 21b was 1 μm . After the above steps, a separation step into individual chips is carried out using a scribe and the like.

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Fig.1

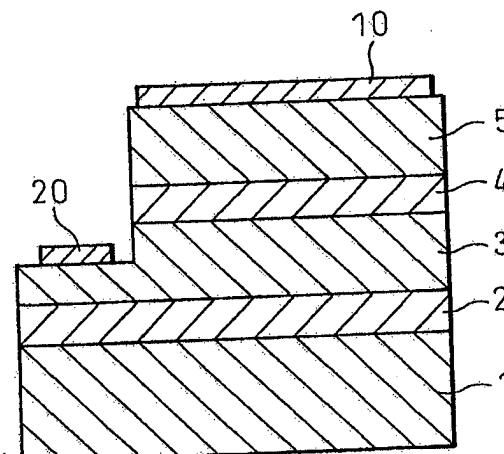


Fig. 2

